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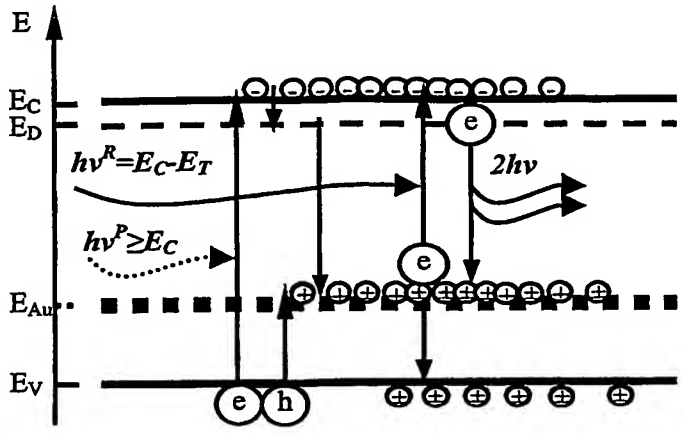
(54) Title: APPARATUS AND METHODS FOR OPTICAL AMPLIFICATION IN SEMICONDUCTORS



(57) Abstract: Methods and corresponding apparatus for optical amplification in semiconductors, particularly indirect band-gap semiconductors, and most particularly in silicon. A first aspect of the invention employs certain doping elements to provide inter-band-gap energy levels in combination with optical or current-injection pumping- The doping element, preferably a noble metal and most preferably Gold, is chosen to provide an energy level which enables an energy transition corresponding to a photon of wavelength equal to the signal wavelength to be amplified. The energy transition may be finely "adjusted" by use of standard doping techniques (such as n-type or p-type doping) to alter the conduction and valence band energy levels and thereby also the magnitude of the energy transition. A second aspect of the invention relates to the use of a non-homogeneous heat distribution which has been found to lead to optical amplification effects.

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